

Remarks

Reconsideration and allowance of the subject application are respectfully solicited.

Claims 1-30 remain pending in the application, with Claims 1, 23, 24, 28 and 30 being independent.

The abstract was objected to for including legal phraseology. In response, the abstract has been amended to delete all occurrences of the term "means". Favorable consideration is requested.

Applicants note with appreciation the indication that Claim 27 recites allowable subject matter. This claim was objected to for being dependent upon a rejected base claim. However, this claim will not be rewritten in independent form at this time because its independent claim is believed to be allowable for the reasons discussed below.

Claims 1-3, 8-16, 18-23 and 28-30 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,254,217 (Askeland et al.). Claim 17 was rejected under 35 U.S.C. § 103 as being unpatentable over Askeland et al. in view of U.S. Patent No. 4,593,295 (Matsufuji et al.). Claims 4-7 and 24-26 were rejected under § 103 as being unpatentable over Askeland et al. in view of U.S. Patent No. 5,907,332 (Fujita et al.). These rejections are respectfully traversed.

As is recited in independent Claim 1, the present invention relates to a printing apparatus for forming a color image by applying different color inks to a printing material while bi-directionally moving a recording head to scan the printing material. The apparatus includes control means, changing means and forming means. The control means

effects recording by application of ink for each pixel area as a unit, the pixel area representing a primary or secondary color. The control means is effective to control a number of ink droplets of each color applied to each pixel area and an amount of the ink applied by a unit application of the ink. The changing means changes an order of applications of the inks of different colors to be applied at least at one amount for printing the secondary color to a secondary color pixel area. The forming means forms the secondary color while making the order of applications of the inks to at least one of a plurality of the secondary color pixel areas arranged along a predetermined direction different from the order of another, by the changing means.

As is recited in independent Claim 23, the present invention relates to a printing apparatus for forming a color image by application of different color inks to a printing material while bi-directionally moving a recording head to scan the printing material. The apparatus includes control means, changing means and forming means. The control means effects recording by application of the ink for each pixel area, the control means applying different color inks to a pixel area representing a process color and controlling an amount of the ink applied by a unit application in accordance with multi-level data corresponding to the pixel area. The changing means changes an order of applications of inks of different colors to be applied at least at one amount to form a process color in a process color pixel area. The forming means forms the process color by making an order of applications of the inks to at least one of the process color pixel areas arranged in a raster direction different from the order of another, by the changing means.

As is recited in independent Claim 24, the present invention relates to a printing apparatus for forming a color image by effecting scanning bi-directional movement of a recording head having recording elements corresponding to different color inks arranged symmetrically in a scanning direction and applying the color inks at different amounts. The apparatus includes a plurality of print buffers corresponding to the symmetrically arranged recording elements and distributing means for distributing print data for a color to be printed to at least one of the print buffers on the basis of an image signal corresponding to the color image.

As is recited in independent Claim 28, the present invention relates to a printing method for forming a color image by application of different color inks onto a printing material at different amounts while bi-directionally moving a recording head to scan the printing material, wherein recording is effected by application of ink for each pixel area as a unit, the pixel area representing a primary or secondary color, and a number of ink droplets of each color applied to each pixel area and an amount of the ink applied by a unit application of the ink are controlled in accordance with multi-level data. The method includes a first step of application of ink of a certain color ink at least at one amount to form a secondary color to a secondary color pixel area and a second step of application of different color inks to form the secondary color in the secondary color pixel area in an order of applications which is different from the order in the first step.

As is recited in independent Claim 30, the present invention relates to a print having a color image provided by different color inks, including a printing material a plurality of secondary color pixel areas arranged in a predetermined direction on the

printing material. The plurality of pixel areas are printed by different color inks at least at one amount, and wherein an order of applications of the inks to at least one of the pixel areas is different from the order of another.

Askeland et al. relates to a printing method and apparatus for reducing hue shift due to differing deposition orders of different color ink drops. As understood by Applicants, Askeland et al. recognizes the problem of hue differences attributable to the difference in the order of color overlapping in bi-directional printing. More particularly, Askeland et al. is directed to printing control in which the recording head is scanned and the distance of feeding of the recording material is less than the length of the nozzle array, by which one recording line is printed in a plurality of scanning operations. In each of the forward and backward scanning operations, a different mask pattern for controlling ejections for each pixel position is used. The mask pattern is properly selected so that the order of overlapping of the color inks and the amounts of inks to be overlapped at each pixel position are controlled, so as to solve the problem of hue difference.

The mask patterns discussed above are shown in Figs. 8A-8C of Askeland et al. With each mask pattern, two or three ink droplets are ejected for each color and for each pixel, and in addition different mask patterns are used for respective colors, so that the order of overlapping of the inks and/or amounts of the inks differ depending on the pixels and depending on whether the pixels are present in the image. Such mask patterns are used to mask the data of the image to be printed, and depending on the image to be recorded, the mask patterns are synchronous with the image data. Applicants submit, therefore, that pixels having the same ink overlapping may be printed on the recording material.

It is respectfully submitted that Askeland et al. does not disclose or suggest at least changing an order of applications of inks of different colors to be applied at least at one amount for printing a secondary color to a secondary color pixel area, as is recited in independent Claim 1.

Nor does Askeland et al. disclose or suggest changing an order of applications of inks of different colors to be applied at least at one amount to form a process color in a process color pixel area, as is recited in independent Claim 23.

Askeland et al. is also not believed to disclose or suggest a plurality of print buffers corresponding to symmetrically arranged recording elements, as is recited in independent Claim 24.

Askeland et al. does not disclose or suggest a first step of application of ink of a certain color ink at least at one amount to form a secondary color to a secondary color pixel area, and a second step of application of different color inks to form the secondary color in the secondary color pixel area in an order of applications which is different from the order in the first step, as is recited in independent Claim 28.

Askeland et al. also does not disclose or suggest a plurality of pixel areas being printed by different color inks at least at one amount, wherein an order of applications of the inks to at least one of the pixel areas is different from the order of another, as is recited in independent Claim 30.

Thus, Askeland et al. fails to disclose or suggest important features of the present invention recited in the independent claims.

Matsufuji et al. relates to an ink jet recording apparatus including a recording section in which the arrangement of colors of head unit 10a that are shifted upward is made opposite to the order of that in head unit 10b that are shifted downward. Thus, the order of colors can be considered symmetrical. However, because one head unit is shifted upwardly and the other downwardly, the recording positions are offset in the sub-scanning direction so as to print in the manner shown in Fig. 5. Applicants respectfully submit that at most Matsufuji et al. describes a recording device in which dots having different ink application orders are alternated with respect to the sub-scanning direction. It is not possible to change a plurality of ink application orders.

Thus, Matsufuji et al. fails to remedy the deficiencies of Askeland et al. noted above with respect to the independent claims.

Fujita et al. describes an ink jet recording apparatus including an image processor 103 and four buffers 105c, 105m, 105y, 105k for temporarily storing color data of cyan, magenta, yellow and black, respectively. However, Fujita et al. is not believed to remedy the deficiencies of the citations noted above with respect to the independent claims.

Thus, independent Claims 1, 23, 24, 28 and 30 are patentable over the citations of record. Reconsideration and withdrawal of the §§ 102 and 103 rejections are respectfully requested.

For the foregoing reasons, Applicants respectfully submit that the present invention is patentably defined by independent Claims 1, 23, 24, 28 and 30. Dependent Claims 2-22, 25-27 and 29 are also allowable, in their own right, for defining features of

the present invention in addition to those recited in their respective independent claims.

Individual consideration of the dependent claims is requested.

This Amendment After Final Rejection does not raise new issues, is an earnest attempt to advance prosecution and reduce the number of issues, and is believed to clearly place this application in condition for allowance. This Amendment was not earlier presented because Applicants earnestly believed that the prior Amendment placed the subject application in condition for allowance. Accordingly, entry of this Amendment under 37 CFR 1.116 is respectfully requested.

Applicants submit that the present application is in condition for allowance. Favorable reconsideration, withdrawal of the objections and rejections set forth in the above-noted Office Action, and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



Attorney for Applicants

Registration No. 33,628

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200

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